Exhibit 1

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TQ DELTA, LLC,

        Plaintiff,

        v.

2WIRE, INC.,

        Defendant.

Civil Action No. 1:13-cv-01835-RGA

TQ DELTA, LLC,

        Plaintiff,

        v.

ZYXEL COMMUNICATIONS, INC
and
ZYXEL COMMUNICATIONS
CORPORATION,

        Defendants.

Civil Action No. 1:13-cv-02013-RGA

TQ DELTA, LLC,

        Plaintiff,

        v.

ADTRAN, INC.,

        Defendant.

Civil Action No. 1:14-cv-00954-RGA

ADTRAN, INC.,

        Plaintiff,

    v.

TQ DELTA, LLC,

        Defendant.

Civil Action No. 1:15-cv-00121-RGA

MEMORANDUM OPINION

Brian E. Farnan, and Michael J. Farnan, FARNAN LLP, Wilmington, DE; Peter J. McAndrews, Esq. (argued) and Rajendra A. Chiplunkar, MCANDREWS, HELD & MALLOY, (Chicago, IL).

      Attorneys for Plaintiff

Colm F. Connolly and Jody Barillare, MORGAN LEWIS & BOCKIUS LLP, Wilmington, DE; Brett M. Schuman (argued), Rachel M. Walsh (argued), and David L. Simpson, GOODWIN PROCTOR LLP, San Francisco, CA.

      Attorneys for Defendant 2WIRE, Inc.

Kenneth L. Dorsney, MORRIS JAMES LLP, Wilmington, DE.

      Attorney for Defendants Adtran Inc. and Zyxel Communications Inc.

January 30, 2018

ANDREWS, U.S. DISTRICT JUDGE:

Presently before the Court is the issue of claim construction of multiple terms in U.S. Patent Nos. 7,570,686 ("the '686 patent"); 7,835,430 ("the '430 patent"); 7,889,784 ("the '784 patent"); 8,238,412 ("the '412 patent"); and 9,432,956 ("the '956 patent"). The Court has considered the Parties' Joint Claim Construction Brief. (Civ. Act. No. 13-01835-RGA, D.I. 342; Civ. Act. No. 13-02013-RGA, D.I. 327; Civ. Act. No. 14-00954-RGA, D.I. 180; Civ. Act. No. 15-00121-RGA; D.I. 182).[1] The Court heard oral argument on September 5, 2017. (D.I. 357). The Court subsequently heard testimony from two technical experts and received supplemental submissions.

I. BACKGROUND

The patents-in-suit represent "Family 1" of the patents that Plaintiff has asserted against Defendants, and they all share a common specification. (D.I. 342 at 12 n.1). The Family 1 patents claim both an apparatus and method for the reliable exchange of diagnostic and test information over a multicarrier communications system.

II. LEGAL STANDARD

"It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (citation omitted). "'[T]here is no magic formula or catechism for conducting claim construction.' Instead, the court is free to attach the appropriate weight to appropriate sources 'in light of the statutes and policies that inform patent law.'" *SoftView LLC v. Apple Inc.*, 2013 WL 4758195, at *1 (D. Del. Sept. 4, 2013) (quoting *Phillips*, 415 F.3d at 1324) (alteration in original). When construing patent claims, a court considers the literal language of the claim, the patent specification, and the prosecution history. *Markman v. Westview Instruments,*

---

[1] Unless otherwise specifically noted, all references to the docket refer to Civil Action No. 13-1835-RGA.

Inc., 52 F.3d 967, 979-80 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). Of these sources,

"the specification is always highly relevant to the claim construction analysis. Usually, it is

dispositive; it is the single best guide to the meaning of a disputed term." *Phillips*, 415 F.3d at

1315.

"[T]he words of a claim are generally given their ordinary and customary meaning. . . .

[This is] the meaning that the term would have to a person of ordinary skill in the art in question

at the time of the invention, i.e., as of the effective filing date of the patent application." *Id.* at

1312-13. "[T]he ordinary meaning of a claim term is its meaning to [an] ordinary artisan after

reading the entire patent." *Id.* at 1321. "In some cases, the ordinary meaning of claim language

as understood by a person of skill in the art may be readily apparent even to lay judges, and claim

construction in such cases involves little more than the application of the widely accepted meaning

of commonly understood words." *Id.* at 1314.

When a court relies solely upon the intrinsic evidence—the patent claims, the specification,

and the prosecution history—the court's construction is a determination of law. *See Teva Pharms.*

USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 841 (2015). The court may also make factual findings

based upon consideration of extrinsic evidence, which "consists of all evidence external to the

patent and prosecution history, including expert and inventor testimony, dictionaries, and learned

treatises." *Phillips*, 415 F.3d at 1317-19. Extrinsic evidence may assist the court in understanding

the underlying technology, the meaning of terms to one skilled in the art, and how the invention

works. *Id.* Extrinsic evidence, however, is less reliable and less useful in claim construction than

the patent and its prosecution history. *Id.*

"A claim construction is persuasive, not because it follows a certain rule, but because it

defines terms in the context of the whole patent." *Renishaw PLC v. Marposs Societa' per Azioni*,

2

158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that "a claim interpretation that would exclude

the inventor's device is rarely the correct interpretation." *Osram GMBH v. Int'l Trade Comm'n*,

505 F.3d 1351, 1358 (Fed. Cir. 2007) (citation omitted).

III.   CONSTRUCTION OF DISPUTED TERMS

The asserted patents claim both an apparatus and a method for the reliable exchange of

diagnostic and test information over a multicarrier communications system. Plaintiff asserts claim

5 of the '686 patent, claims 1 and 2 of the '430 patent, claims 1 and 2 of the '784 patent, claims 1-

4 of the '412 patent, and claims 1-4 of the '956 patent. (D.I. 342 at 28-32). Claim 5 of the '686

patent is representative and reads as follows:

> 5. A diagnostic system capable of communicating diagnostic information over a
> communication channel using multicarrier modulation comprising:
>
> > a *transceiver* capable of transmitting or receiving an initiate diagnostic
> > mode message; and
> >
> > a *message determination module capable of determining and, in
> > cooperation with the transceiver, transmitting a diagnostic message* from
> > the transceiver, wherein the diagnostic message comprises a plurality of
> > data variables representing the *diagnostic information* about the
> > communication channel and *each bit in the diagnostic message is mapped
> > to at least one DMT signal*, and wherein one variable comprises an *array
> > representing frequency domain received idle channel noise information.*

('686 patent, claim 5) (disputed terms italicized).

3

1.   **"transceiver"**

      a.   *Plaintiff's proposed construction*: "communications device capable of transmitting and receiving data wherein the transmitter portion and receiver portion share at least some common circuitry"

      b.   *Defendants' proposed construction*: "communications device capable of transmitting and receiving data"

      c.   *Court's construction*: "communications device capable of transmitting and receiving data wherein the transmitter portion and receiver portion share at least some common circuitry"

This term appears in all five of the asserted patents. The parties agree that a transceiver is a communications device that can transmit and receive data. They also agree that transceiver should be given its plain and ordinary meaning, but dispute whether the plain and ordinary meaning requires that the transceiver's transmitter and receiver portions share common circuitry. (D.I. 342 at 35). The specification does not provide an explicit definition of transceiver.

Plaintiff offers two dictionary definitions as extrinsic evidence that a person of ordinary skill ("POSA") would understand that a transceiver's transmitter and receiver portions share common circuitry. (*Id.* at 34). Both definitions include a limitation that a transceiver's transmitter and receiver share common circuitry. (D.I. 343 at A53, A57). Defendants criticize Plaintiff's proposed construction as "an extraneous, irrelevant constraint" that improperly imports a limitation and relies "wholly on evidence extrinsic to the asserted patents." (D.I. 342 at 35, 36, 41).

Evaluating the intrinsic evidence in light of the dictionary definitions provided suggests that a POSA would understand the transmitter and receiver portions to share common circuitry or components. *Phillips*, 415 F.3d at 1318 ("Because dictionaries, and especially technical dictionaries, endeavor to collect the accepted meanings of terms used in various fields of science and technology, those resources have been properly recognized as among the many tools that can

4

assist the court in determining the meaning of particular terminology to those of skill in the art of the invention."). Therefore, I will construe transceiver to mean "a communications device capable of transmitting and receiving data wherein the transmitter portion and receiver portion share at least some common circuitry."

2.   "diagnostic information"

a.   *Plaintiff's proposed construction*: "information relating to a characteristic of a communication channel collected and communicated in a diagnostic mode"

b.   *Defendants' proposed construction*: "information relating to a characteristic of a communication channel or the communications equipment operating on that channel"

c.   *Court's construction*: "information relating to a characteristic of a communication channel or the communications equipment operating on that channel"

This term appears in the asserted claims of the '686 and '956 patents. The parties agree that diagnostic information may include both information relating to a characteristic of a communication channel and information relating to a characteristic of the communications equipment operating on that channel. (D.I. 357 at 26:17-27:11). The parties dispute whether diagnostic information is limited to information "collected and communicated in a diagnostic mode." (D.I. 342 at 55).

Defendants argue that Plaintiff attempts to import a limitation from the specification to restrict the claim language to a single embodiment. (*Id.* at 44). Plaintiff asserts that the claims reciting diagnostic information "are directed to the embodiment where information relating to the communication channel is collected and communicated while in the diagnostic mode." (*Id.* at 43). As support, Plaintiff offers only its expert's unsupported declaration. (*Id.*). This alone is not sufficient to support Plaintiff's proposed construction.

5

Plaintiff also argues that "claim differentiation counsels against adopting" Defendants' proposed construction and points out that "the only difference between independent claim 1 of the '956 patent and independent claim 1 of the '412 patent is that one recites 'diagnostic information' and the other recites 'test information.'" (*Id.* at 41-42). As the Federal Circuit has recognized, however, "two claims with different terminology can define the exact same subject matter." *Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1380 (Fed. Cir. 2006); *see also Hormone Research Found. v. Genentech, Inc.*, 904 F.2d 1558, 1567 n.15 (Fed. Cir. 1990) ("It is not unusual that separate claims may define the invention using different terminology, especially where (as here) independent claims are involved."). As Defendants point out, the specification recites "test information" alongside "diagnostic mode" the majority of the time, including in sections of the patent that describe the invention as a whole, such as the Summary of Invention. (D.I. 342 at 57-58). The Federal Circuit has recognized that claim differentiation can be overridden by a contrary suggestion in the specification. *Atlas IP, LLC v. Medtronic, Inc.*, 809 F.3d 599, 607 (Fed. Cir. 2015). Here, the Family 1 specification discloses that diagnostic information may be collected and transmitted in the normal steady state communications mode. ('686 patent at 1:22-32; 2:21-26).

Defendants also contend that Plaintiff's construction is incorrect because adopting Plaintiff's proposed construction would render superfluous language in unasserted independent claim 40 of the '686 patent. (D.I. 357 at 44:23-46:2). If the transmission of diagnostic information were limited to a diagnostic mode, the limitation in claim 40 that a diagnostic message be "transmit[ed] during a diagnostic mode" would have no meaning. (*Id.*).

I agree with Defendants. Under Plaintiff's construction, the diagnostic mode limitation in independent claim 40 of the '686 patent would be superfluous, and that limitation would have no

6

effect. *See Curtiss-Wright*, 438 F.3d at 1380-81. Nothing in claim 5 of the '686 patent or in any

of the asserted claims of the '956 patent limits those claims to a diagnostic mode. (*See* '686 patent

at 9:3-17; '956 patent at 8:47-9:7). Nor does the language in the specification support limiting

diagnostic information to information collected in a diagnostic mode. Therefore, the intrinsic

evidence does not support Plaintiff's proposed limitation and I will adopt Defendants'

construction.

3.   "array representing frequency domain received idle channel noise information"

      a.   *Plaintiff's proposed construction*: "ordered set of values representative of noise in
           the frequency domain that was received by a transceiver on respective
           subchannels in the absence of a transmission signal on the respective
           subchannels"

      b.   *Defendants' proposed construction*: "ordered set of values representative of noise
           in the frequency domain that was received by a transceiver on respective
           subchannels in the absence of a transmission signal"

      c.   *Court's construction*: "ordered set of values representative of noise in the
           frequency domain that was received by a transceiver on respective subchannels in
           the absence of a transmission signal on the received channel"

The parties do not dispute the claim term requires that the subchannel on which the noise

is measured be idle. (D.I. 342 at 60-61). They also agree that detected noise "includes noise

created by crosstalk from transmission signals [from] other channels in the vicinity of the

subchannels being measured," and would include "noise from signals on other lines." (*Id.*). The

parties dispute how many of the surrounding subchannels must be idle.

Defendants argue that all of the subchannels within the channel of which the measurement

subchannel is a part must be idle. (*Id.* at 66). They assert that their proposed construction is

consistent with the claim language reciting "'idle channel noise information,' and not 'idle

subchannel noise information,'" and that Plaintiff's construction is not supported by any intrinsic

7

evidence. (*Id.* at 62). Defendants further contend that Dr. Chrissan's prior IPR testimony for the '430 patent that "the transmitter is off" when a channel is idle is inconsistent with Plaintiff's proposed construction. (*Id.* at 61). If "the transmitter is off" when a channel is idle, then no transmission signal should be detected on the measured channel. (Chrissan IPR Testimony, D.I. 343 at A205, 133:12-134:7). Therefore, Plaintiff's proposed construction is incorrect because it "would permit an interpretation that despite the transmitter being 'off' (and therefore not transmitting), a transmission signal could be received on some subchannels, but be absent for other[]" subchannels within the measured channel. (D.I. 342 at 61).

Plaintiff argues that only the subchannel on which noise is being measured need be idle; other subchannels within the same channel as the measurement subchannel may be transmitting data during the measurement period. (*Id.* at 63). When the parties briefed this term, Plaintiff's stated concern with Defendants' proposed construction was "that it might be understood to require the absence of transmission signals on channels adjacent to the channel being measured, including the example sources of idle channel noise discussed in the intrinsic evidence—'adjacent phone lines, such as, for example, ADSL, HDSL, ISDN, T1, or the like.'" (*Id.* at 62-63). To support its construction, Plaintiff cites the Family 1 specification's mention of "other data services on adjacent phone lines," such as "voice communications" when discussing noise or disturbances. (*Id.* at 60 (citing '686 patent at 1:44-45)). The cited portion of the patent does not mention subchannels or otherwise suggest that these "other services" would be transmitting data on the channel on which noise is measured. None of Plaintiff's Family 1 specification citations referring explicitly to subchannels appear in the context of a discussion of noise or data disturbances. (*See id.* at 63-64 (citing '686 patent at 2:5-12; 4:66-5:2)). Plaintiff relies solely on its expert's unsupported

declaration for the proposition that multicarrier communication and voice communication use separate subchannels, but not separate channels, on the same line. (*Id.* at 64-65).

I agree with Defendants that Plaintiff's proposed construction imposes a limitation that is not present in the claim language. As Plaintiff points out, however, Defendants' proposed construction allows the interpretation that there is no transmission signal on channels adjacent to the channel being measured. Therefore, I decline to adopt either party's proposed construction and instead will construe this term to mean "ordered set of values representative of noise in the frequency domain that was received by a transceiver on respective subchannels in the absence of a transmission signal on the received channel."

4.   "DMT signal"

    a.   *Plaintiff's proposed construction*: "signal resulting from DMT modulation where the signal has the duration of a DMT symbol period"

    b.   *Defendants' proposed construction*: "signal resulting from DMT modulation"

    c.   *Court's construction*: "signal resulting from DMT modulation"

The term "DMT signal" appears only once in the '686 patent, in asserted claim 5. After oral argument on claim construction, the Court held a supplemental hearing during which Plaintiff's expert, Dr. Chrissan, and Defendants' expert, Dr. Jacobsen, offered testimony on the construction of this term. (D.I. 431). The parties agree that a "DMT signal" results from DMT modulation but dispute whether a "DMT signal" is limited to "the duration of a DMT symbol period." (D.I. 342 at 78-79). They also agree that a DMT symbol has the duration of a DMT symbol period. (D.I. 431 at 16:1-2; *see id.* at 87:10-11). The parties do not dispute that a POSA would have consulted the contemporaneous ADSL standard, mentioned in the specification's discussion of one bit per DMT symbol modulation, to determine the meaning of "DMT signal" in the context of the Family 1 patents. (D.I. 342 at 81, 84, 87; '686 patent at 3:44-67).

9

The essence of Defendants' argument is that Plaintiff's proposed construction finds no support in the intrinsic evidence, and further, that it does not comport with a POSA's understanding of the term "DMT signal" at the relevant time. Defendants argue that Plaintiff's sole basis for its proposed construction adding the "DMT symbol period" limitation "rests on an assertion found only in Dr. Chrissan's declaration." (D.I. 342 at 76). Defendants also maintain that Plaintiff's proposed construction of "DMT signal" improperly equates the term with "DMT symbol." (*Id.* at 77). Plaintiff's proposed construction cannot be correct, Defendants contend, because "six other independent claims in the '686 patent (claims 1, 9, 13, 17, 40, and 41) recite [the "DMT symbol"] limitation," and independent claim terms are presumed to have different meanings and scope when different words or phrases are used in the claims. (*Id.* (citing *Seachange Int'l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1368-69 (Fed. Cir. 2005))). Finally, Defendants argue that Plaintiff's proposed construction is inconsistent with the ADSL standard mentioned in the specification. (*Id.* at 81).

Plaintiff contends that Defendants' proposed "construction of 'DMT signal' is vague in that it does not define the period of the signal that is used to communicate only a single bit." (*Id.* at 78). Plaintiff argues that when the ADSL standard states that the REVERB1 signal "is transmitted consecutively for 4096 symbols," it "means that the REVERB1 signal having a duration of one symbol period is transmitted consecutively (i.e., one after another repeatedly without interruption) for 4096 DMT symbol periods during the R-REVERB-1 initialization state, not that the REVERB1 signal itself has a duration of 4096 symbol periods." (*Id.* at 84-85). Plaintiff cites only one unsupported paragraph in its expert's declaration as evidence for this proposition. (*Id.* at 85). Plaintiff provides no intrinsic evidence to support its proposed construction.

I agree with Defendants. During the supplemental hearing, both parties' experts offered

testimony regarding how a POSA would have understood the term "DMT signal" in the context

of the Family 1 patents at the relevant time. While Dr. Jacobsen's testimony reconciles the

specification with the ADSL standard referenced in the patent, Dr. Chrissan's testimony is

inconsistent with the ADSL standard.

Dr. Jacobsen testified that as of the priority date, a POSA would have understood the term

"DMT signal" to refer the transmission signal resulting from DMT modulation, that is, "the

continuous analog signal that emerges from the digital to analog converter" and "is launched onto

the twisted pair." (D.I. 431 at 79:16-19, 87:23-25). As support, Dr. Jacobsen offered additional

pieces of extrinsic evidence, from her dissertation and a book chapter titled "Fundamentals of

Multicarrier Modulation," that use the term "DMT signal" in a manner consistent with Defendants'

proposed construction. (*See id.* at 79:24-86:12). According to Dr. Jacobsen, "A DMT signal is

not limited to one symbol period." (*Id.* at 88:15-16). The relevant ADSL standard supports this

notion, disclosing that, "The description of a signal will consist of three parts . . . . The second is

a statement of the required duration, expressed in DMT symbol periods, of the signal." (D.I. 343

at A150).

Dr. Chrissan disagrees. The '686 patent characterizes the C-RATES1 messaging scheme

in the relevant ADSL standard as an exemplary embodiment of "one bit per DTM [sic] symbol

modulation," and, in the following paragraph, discloses that, "In the one bit per DMT symbol

modulation message encoding scheme, a bit with value 0 is mapped to the REVERB1 signal and

a bit with a value of 1 mapped to a SEGUE1 signal." ('686 patent at 3:46-57). According to Dr.

Chrissan, the REVERB1 and SEGUE1 signals disclosed in this embodiment are DMT signals that

are one symbol in length. (D.I. 431 at 18:14-16, 24:5-6, 25:14-16). Dr. Chrissan argues that if the

11

REVERB1 and SEGUE1 signals disclosed in the patent were longer than one symbol in length, they would not embody "the one bit per DMT symbol modulation message encoding scheme" as described in the patent and would represent an internal inconsistency in the specification.

Under Dr. Chrissan's understanding of "DMT signal," however, the patent's "one bit per DMT symbol modulation" disclosure is inconsistent with the ADSL standard to which the patent refers. Though Dr. Chrissan's interpretation limits the REVERB1 and SEGUE1 signals disclosed in the patent to one symbol period, the ADSL standard defines each of the durations of the REVERB1 and SEGUE1 signals as being longer than one symbol period.[2] If a "DMT signal" is limited to one symbol period in duration as Plaintiff proposes, then the ADSL standard makes clear that C-REVERB1 (512 symbols, resulting in a 512 symbol period duration), R-REVERB1 (4096 symbols, 4096 symbol period duration), and C-SEGUE1 (10 symbol periods) are each too long to qualify as a "DMT signal." (D.I. 343 at A155-A158). Nor would the C-RATES1 message (992 symbols, 992 symbol periods), discussed in the same section of the patent, qualify as a "DMT signal." ('686 patent at 3:44-67; D.I. 343 at A159).

The ADSL standard is consistent with the patent's disclosure that the C-RATES1 messaging scheme represents a "one bit per DTM [sic] symbol modulation." ('686 patent at 3:44-53; D.I. 343 at A159 ("Only one bit of information is transmitted in each symbol of C-RATES1")). Contrary to Dr. Chrissan's assertion that the REVERB1 and SEGUE1 DMT signals are one symbol in length, Dr. Jacobsen explained that the ADSL standard confirms that "there is no REVERB1 signal in the C-RATES messaging scheme. There's a C-RATES signal that is made from the first

---

[2] Neither party cites any portion of the ADSL standard that refers to a "REVERB1" signal or a "SEGUE1" signal without a prefix. The parties do not appear to dispute the identity of the relevant REVERB1 and SEGUE1 signals, which are those involved in the C-RATES1 messaging scheme disclosed in the specification: R-REVERB1, C-REVERB1, and C-SEGUE1. ('686 patent at 3:44-67; D.I. 343 at A159). As Dr. Jacobsen explained, in the ADSL standard, REVERB1 signals are preceded by either "C-" or "R-" depending on which transceiver is generating the signal, and they differ in duration. (D.I. 431 at 88:18-89:8).

DMT symbol of either [the] REVERB1 [signal] or SEGUE1 [signal], depending on whether it's a one [bit] or a zero [bit]." (D.I. 431 at 97:22-98:25 ("The standard specifically states that it's one symbol of this otherwise larger signal."); D.I. 343 at A159 ("Only one bit of information is transmitted in each symbol of C-RATES1: a zero bit is encoded to one symbol of C-REVERB1 and a one bit is encoded to one symbol of C-SEGUE1. Since there are a total of 992 bits of C-RATES1 information, the duration of C-RATES1 is 992 symbols.")). The patentee's choice to discuss the "REVERB1 signal" and the "SEGUE1 signal" in the context of "the one bit per symbol DMT modulation message encoding scheme" thus may have been a matter of imprudent shorthand or sloppy drafting. It is a portion of a "REVERB1 signal" or "SEGUE1 signal" that corresponds to one symbol period in duration; the entire signals themselves are not used in "one bit per DMT symbol modulation message encoding scheme." (*See* D.I. 431 at 97:22-98:25; D.I. 343 at A159 (discussing the C-RATES1 one bit per symbol modulation scheme)).

Plaintiff's proposed construction, supported only by Dr. Chrissan's testimony, is contradicted by the ADSL standard and Dr. Jacobsen's testimony. (D.I. 431 at 25:14-16). During the supplemental hearing, I also found Dr. Jacobsen to be a more credible witness than Dr. Chrissan. (*Id.* at 110:13-111:6). Therefore, I construe "DMT signal" to mean "signal resulting from DMT modulation."

5.   **"each bit in the diagnostic message is mapped to at least one DMT signal"**

a.   *Plaintiff's proposed construction*: "each bit in the diagnostic message is communicated using a modulation scheme where a DMT signal (or two or more DMT signals) represents only a single bit of the diagnostic message"

b.   *Defendants' proposed construction*: "indefinite"

c.   *Court's construction*: "each bit in the diagnostic message is mapped to either (1) one signal resulting from DMT modulation or (2) more than one signal resulting from DMT modulation"

This term appears in asserted claim 5 of the '686 patent. Its construction turns in part on the construction for "DMT signal."

Plaintiff argues that Defendants have conceded that this claim language is not indefinite because Defendants argued in their § 101 motion that the claims of the Family 1 patents are invalid because the "specification establishes that [the claimed mapping] are standard features of the communication system that form the backdrop for the claimed invention." (D.I. 342 at 67-68 (alteration in original)). Defendants counter that Plaintiff "misrepresents 2Wire's arguments in the *Alice* motion." (*Id.* at 76). Plaintiff's argument ignores Defendant 2Wire's statement on the same page of the briefing accompanying its § 101 motion that, "For purposes of this motion only, 2Wire adopts TQ Delta's interpretation of [claim 5 of the '686 patent]." (D.I. 259 at 12 n.6). Whereas 2Wire made its § 101 motion arguments under Plaintiff's proposed construction of "DMT signal," Defendants advance their indefiniteness arguments for this term under Defendants' proposed construction for "DMT signal." Thus, I find that Defendants have not conceded that this term is not indefinite on the basis of 2Wire's § 101 motion.

Plaintiff's proposed construction for this term presupposes the Court's adoption of its proposed construction for "DMT signal," and it depends on the argument that the "REVERB1 signal" and "SEGUE1 signal" disclosed in the patent specification are "DMT signals." This

14

argument relies entirely on Dr. Chrissan's unsupported declaration. (*See, e.g.*, D.I. 342 at 69-71). I have declined to credit Dr. Chrissan's declaration and testimony with respect to the term "DMT signal," because both are inconsistent with the relevant ADSL standard and Dr. Jacobsen's testimony. Therefore, I decline to adopt Plaintiff's proposed construction.

Plaintiff further urges that even under Defendants' construction of "DMT signal," this term is not indefinite, because "the scope of the claim is still known with reasonable certainty, even if the scope of the claim would then include an impractical embodiment." (*Id.* at 75). Defendants disagree and argue that claim 5 of the '686 patent is indefinite if their construction for "DMT signal" is adopted. (*Id.* at 71). According to Defendants, "[a] person of ordinary skill in the art would not understand how a bit in a message could be mapped to more than one DMT signal because there is only one DMT signal—the transmission signal—with which a transceiver could transmit a message." (*Id.*). Defendants argue that because all embodiments in which a bit is mapped to more than one DMT signal would be impossible, rather than merely impractical, the "claim scope [is] uncertain and the term indefinite." (*Id.* at 75). Regardless, Defendants maintain that, "To the extent that each bit in the diagnostic message is mapped to *only* one DMT signal, the term is simply non-limiting." (*Id.* at 72).

Defendants acknowledge, however, that, "A person of ordinary skill in the art certainly would understand that each bit must be mapped to one DMT signal (*i.e.*, the transmission signal), otherwise it would never be transmitted." (*Id.* at 72). Dr. Chrissan testified that although "bit mapping" in the strictest sense happens in the QAM encoder, "in the general sense one understands that bits are maps of the signal. Otherwise, they wouldn't get to the other side." (D.I. 431 at 50:21-51:21). During the supplemental hearing, Dr. Jacobsen did not directly dispute Dr. Chrissan's testimony about bit mapping in the general sense. Although she testified that the POSA "would

15

not have referred to mapping bits to signals" she also testified that the phrase "each bit of the diagnostic message is mapped to at least one DMT signal" must be true, because otherwise, the message is "not going anywhere." (*Id.* at 90:2-17).

I conclude that in the context of this term, "at least one" means "one or more." In the disputed term, "at least one" refers to a singular noun, "DMT signal," and nothing in claim 5 of the '686 patent suggests that "at least one" is necessarily plural. Though a POSA may understand that it is impossible to map a single bit to more than one DMT signal, Defendants have failed to meet their burden to prove that a POSA would find it impossible to map a bit to one DMT signal, an embodiment also contemplated by the language of this term. A POSA's knowledge that it is impossible to map a single bit to more than one DMT signal may render this term non-limiting, but that does not make it indefinite.

Even if this term is non-limiting, Defendants have failed to prove by clear and convincing evidence that it would not "inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). Though mapping a single bit to more than one DMT signal may be impossible, the language of the term in the alternative contemplates mapping a single bit to one DMT signal. Defendants have not refuted Plaintiff's expert's testimony that in a general sense, bits are mapped to a signal. Nor have Defendants addressed this term in the context of claim 5 of the '686 patent and the other limitations present in that claim. Therefore, Defendants have failed to prove by clear and convincing evidence that this term, in the context of the claim in which it appears, fails to inform a POSA of the scope of the invention with reasonable certainty. Therefore, I decline to find this term indefinite.

16

I will construe "each bit in the diagnostic message is mapped to at least one DMT signal" to mean "each bit in the diagnostic message is mapped to either (1) one signal resulting from DMT modulation or (2) more than one signal resulting from DMT modulation."

6. **"message determination module capable of determining and, in cooperation with the transceiver, transmitting a diagnostic message"**

Plaintiff's proposed construction	Defendants' proposed construction
Not governed by 35 U.S.C. § 112(6) "hardware and/or software component that assembles the information to be transmitted into a message for transmission by the receiver"	governed by 35 U.S.C. § 112(6) Function: "(i) determining a diagnostic message and (ii) in cooperation with the transceiver, transmitting the diagnostic message;" Structure: indefinite
Plaintiff's alternative construction	**Defendants' alternative construction**
if governed by 35 U.S.C. § 112(6) Function: "determining a diagnostic message comprising a plurality of data variables representing diagnostic information, where the message is transmitted in cooperation with the transceiver" Structure: "The message determination device 310 comprising a processor or controller of the modem or transceiver that implements an algorithm for determining a diagnostic message for transmission by the transceiver. The algorithm comprises identifying the information that needs to be transmitted, retrieving the information from a storage device, assembling the retrieved information into a formatted diagnostic message, and providing the message to the transmitter of the receiver for transmission."	if not governed by 35 U.S.C. § 112(6): "a discrete hardware component that is separate from the transceiver operable to (1) assemble data variables into a diagnostic message based at least in part on the contents of the initiate diagnostic mode message, and (2) in cooperation with the transceiver, transmit the diagnostic message"

    c. *Court's construction*: governed by 35 U.S.C. § 112(6).

        Function: "(1) determining a diagnostic message, and (2) in cooperation with the transceiver, transmitting a diagnostic message"

        Structure: indefinite

17

This term appears in asserted claim 5 and unasserted claim 24 of the '686 patent. After oral argument, the parties submitted supplemental claim construction briefing on this term. (D.I. 447). The parties dispute whether "message determination module" should be construed under 35 U.S.C. § 112(6) as a means-plus-function limitation.

"Message determination module" presumptively is not subject to construction under § 112(6) because it does not recite the word "means." *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). "[W]hen a claim term lacks the word 'means,' the presumption can be overcome and § 112, para. 6 will apply if the challenger demonstrates that the claim term fails to 'recite[] sufficiently definite structure' or else recites 'function without reciting sufficient structure for performing that function.'" *Id.* at 1349 (quoting *Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000)) (alteration in original). "What is important is . . . that the term, as the name for structure, has a reasonably well understood meaning in the art." *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996).

According to Plaintiff, Defendants have not rebutted the presumption, created by the absence of the word "means" in the claim, that the claim is not a means-plus-function claim. (D.I. 342 at 89-90). Plaintiff maintains that the claim is not governed by § 112(6), and that "message determination module" "has a reasonably well understood meaning in the art," offering several arguments in support. (D.I. 447 at 12). First, Plaintiff relies on its expert's unsupported declaration for the proposition that "a person of ordinary skill in the telecommunications arts would understand the recited 'message determination module' as hav[ing] a sufficiently definite meaning as the name for structure." (*Id.* at 10 (citing D.I. 343 at A405-06) (alteration in original)). Second, Plaintiff argues that *Blast Motion, Inc. v. Zepp Labs., Inc.*, 2017 WL 476428 (S.D. Cal. Feb. 6, 2017) establishes, post-*Williamson*, that "the term 'module,' in the context of the telecommunications

18

field, denotes sufficient structure such that § 112, ¶ 6 is not invoked." (D.I. 447 at 11). Third, Plaintiff contends that since "[t]he word 'message' on its own was a well-known term at the time of invention," a POSA would have known (1) the meaning of "message determination," and (2) that "message determination" is accomplished "using software in conjunction with the hardware." (*Id.* at 12-13) Therefore, according to Plaintiff, "a person of ordinary skill in the art understands that 'message determination module' has a sufficiently definite meaning for structure comprising 'a hardware and/or software component that assembles the information to be transmitted into a message for transmission by the transceiver.'" (*Id.* at 13). Fourth, Plaintiff contends that I should discount Dr. Jacobsen's testimony because the dictionary definition of "message" that Plaintiff cites "contradicts Dr. Jacobsen's assertion that skilled artisans did not refer to 'determining a message.'" (*Id.* at 14). Fifth, Plaintiff appears to argue that by complying with the Court's order to supply an alternative, non-means-plus-function construction, Defendants have conceded that "message determination module" should be construed according Plaintiff's proposed construction because Defendants' alternative construction overlaps partially with a portion of Plaintiff's proposed construction. (*Id.* at 12).

Defendants contend that the claim at issue is drafted in traditional means-plus-function format, replacing the term "means" with "module" and reciting two functions performed by the "message determination module." (*Id.* at 18-19; D.I. 342 at 92). "Module," Defendants argue, "sets forth the same black box recitation of structure for providing the same specified function as if the term 'means' had been used." (D.I. 342 at 93). *Williamson* identifies "module" as a common nonce word, and Defendants offer several post-*Williamson* cases in which terms containing the term "module" have been found to constitute means-plus-function limitations. *Williamson*, 792 F.3d at 1350; (D.I. 447 at 19). Defendants' expert submits that, "one of ordinary skill in the art

19

would not understand the term 'message determination module' to connote specific known structure," because "it was not a term of art at the time of invention," nor did POSAs "refer to 'message determination' or 'determining a message.'" (D.I. 447 at 20). According to Defendants, that "message" had a known meaning "does not mean that the larger phrase, a 'message determination module,' would connote specific structure to one of ordinary skill in the art." (*Id.*).

I agree with Defendants and find that this term is governed by § 112(6). First, I find that Dr. Chrissan's declaration asserting that a POSA would understand "message determination module" as having sufficiently definite meaning as the name for structure is entitled to little weight. Dr. Jacobsen disagrees, and Dr. Chrissan did not cite any evidence to support this assertion. The sole citation in the relevant paragraph of Dr. Chrissan's declaration refers to a portion of the '686 patent specification listing the "variables that represent diagnostic and test information," which Dr. Chrissan asserts are part of the "message format." ('686 patent at 4:37-42, D.I. 343 at A405). A POSA's recognition that the specification discloses these variables as part of the "message format" does not compel any conclusions about the broader "message determination module." Nor does it support the conclusion that a POSA would recognize that the claimed "message determination module" has sufficiently definite meaning as the name for structure.

Second, *Blast Motion* does not stand for the broad proposition that the term 'module,' in the context of the telecommunications field, denotes sufficient structure such that § 112(6) is not invoked. *Blast Motion* pertained to the field of motion detection, not telecommunications. *Blast Motion*, 2017 WL 476428 at *1. Additionally, in reaching the conclusion that § 112(6) did not apply to the disputed "module" terms, the *Blast Motion* court (1) focused on the particular claim terms at issue, read in light of the specification, and (2) noted that the specification explicitly mentioned and described structures for each disputed term. *Id.* at *13, *15-16. Here, the '686

20

patent specification does not recite a "message determination module." The § 112(6) analysis is specific to the patent in which the disputed term appears, and Plaintiff's generalization of the holding in *Blast Motion* is inappropriate. The remaining cases cited by Plaintiff to support this argument were decided under the "strong" presumption standard "expressly overrule[d]" in *Williamson*. 792 F.3d at 1349.

Third, contrary to Plaintiff's assertion, conclusions about the terms "message determination" or "message determination module" do not follow from the existence of a known definition for the term "message." I thus find Plaintiff's third and fourth arguments unpersuasive.

Fourth, Plaintiff's assertion that Defendants, through their proposed alternative construction, have somehow conceded that I should adopt Plaintiff's proposed construction is unavailing. Even if Plaintiff could credibly argue that Defendants' proposed alternative construction somehow supersedes Defendants' proposed construction, Plaintiff's argument would fail because Defendants' proposed alternative construction contains additional elements not present in Plaintiff's proposed construction. That Plaintiff's proposed construction and Defendants' proposed alternative construction contain one common element does not provide sufficient basis to adopt Plaintiff's proposed construction.

As Defendants point out, though "module" is substituted for "means," and "capable of" is substituted for "for," the "message determination module" is claimed in traditional means-plus-function format. Claim 5 of the '686 patent recites "a message determination module capable of determining, and, in cooperation with the transceiver, transmitting a diagnostic message." ('686 patent at claim 5). Since "determining" a diagnostic message and "transmitting a diagnostic message" are functions, claim 5 describes the "message determination module" only in terms of its functional capability. The remainder of claim 5 does not provide any structure for the "message

21

determination module," instead reciting information pertaining to characteristics of the "diagnostic message." (*Id.*). *Williamson* recognized "module" as a common nonce word. 792 F.3d at 1350. Though some "module" claim terms may contain words that modify "module" so as to recite sufficiently definite meaning as the name for structure, that is not the case here. It has not been demonstrated that at the relevant time, "message determination" had a known meaning, let alone one that connoted structure. I conclude that the "message determination" prefix does not modify "module" with language so as to impart structure. Nor does reading the claims in light of the specification support the conclusion that "message determination module" has a sufficiently definite meaning as the name for structure, because the specification fails to refer to any sort of "module." Therefore, I conclude that "message determination module" is governed by § 112(6).

Application of § 112(6) proceeds in two steps. *Id.* at 1351. First, the court must identify the claimed function. *Id.* The identified function must be the function "explicitly recited in the claim." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999). Second, "the court must determine what structure, if any, disclosed in the specification corresponds to the claimed function." *Williamson*, 792 F.3d at 1351. "Structure disclosed in the specification qualifies as 'corresponding structure' if the intrinsic evidence clearly links or associates that structure to the function recited in the claim." *Id.* at 1352.

The claimed functions of the "message determination module" are (1) determining a diagnostic message, and (2) in cooperation with the transceiver, transmitting a diagnostic message. ('686 patent at claim 5). This matches Defendants' proposed function. I decline to adopt Plaintiff's proposed function, which imports additional limitations beyond the functions of the "message determination module" explicitly recited in claim 5 of the '686 patent.

22

The parties dispute whether the '686 patent specification discloses sufficient structure corresponding to the functions of the "message determination module" under § 112(6). Defendants maintain that claim 5 of the '686 patent is indefinite because the specification fails to recite sufficient structure. (D.I. 447 at 21-22). Plaintiff contends that the proper structure is a "message determination device comprising a processor or controller of the modem or transceiver that implements an algorithm for determining a diagnostic message for transmission by the transceiver." (*Id.* at 17). Asserting that its proposed "algorithm corresponds to step S200 of the flowchart in Figure 2," Plaintiff argues that its alternative construction identifies sufficient algorithmic structure in the '686 patent. (*Id.* at 17 n.5, 31). Defendants respond that Plaintiff's proposed means-plus-function construction is inadequate for failure to provide a clear link between the structure and the claimed functions. (*Id.* at 39). According to Defendants, Plaintiff's proposed structure is also flawed because it improperly reads out any role for the "message determination module" in transmitting the diagnostic message. (*Id.*).

I agree with Defendants. The intrinsic evidence fails to clearly link or associate Plaintiff's proposed structure to the functions recited in the claim. *See Williamson*, 792 F.3d at 1352. The specification does not disclose "a message determination module," but it does mention "a message determination device 310 [that] determines a diagnostic link message to be forwarded to the central office 200." ('686 patent at 5:60-64). Even with this connection between the "message determination device" and one of the recited functions of the "message determination module," however, the "message determination device" fails to provide sufficient structure. The specification does nothing more than recite the "message determination device" as part of the remote terminal modem and recite its function to "determine[] a diagnostic link message to be forwarded to the central office." (*Id.* at 4:62-66, 5:60-64). Here, "device" is a nonce word that

23

does not connote any more structure than "module." *See Williamson*, 792 F.3d at 1350 ("Generic

terms such as 'mechanism,' 'element,' 'device,' and other nonce words that reflect nothing more

than verbal constructs may be used . . . "). Figure 1 of the '686 patent also discloses the same

"message determination device," but merely represents it as a "black box" in the remote terminal.

('686 patent at Fig. 1).

Plaintiff's assertion that "the class of hardware and/or software structures identified by this

term," such as "module," "is limited and known to those of skill in the art" is contradicted by the

'686 patent specification. (D.I. 342 at 90). Contrary to Plaintiff's argument, the '686 patent

specification does not describe the "message determination device" as a "processor or controller."

The '686 patent separately discloses a "microprocessor or microcontroller" and a "signal

processor" when describing one possible implementation of "the diagnostic link mode system,"

stating that the system "can be implemented either on a single program general purpose

computer . . . [or] on a special purpose computer . . . ." ('686 patent at 7:47-62). Additionally, the

'686 patent states that, "The diagnostic link system and methods illustrated herein however, can

be readily implemented in hardware and/or software using any known or later developed systems

or structures, devices and/or software . . ." (*Id.* at 8:8-14). Rather than disclosing sufficiently

definite structure that corresponds to the claimed function, the '686 patent specification aims

broadly to capture everything under the sun, whether now known or developed in the future. I find

this insufficient to link Plaintiff's proposed structure to the claimed function, and insufficient to

impart sufficiently definite structure corresponding to the claimed function.

Therefore, I conclude that the '686 patent specification fails to recite sufficiently definite

structure for the "message determination module." Accordingly, I find claim 5 of the '686 patent

invalid as indefinite.

24

25

IV.   CONCLUSION

Within five days the parties shall submit a proposed order consistent with this Memorandum Opinion suitable for submission to the jury.